In vivo and *in vitro* parameters for acaricide efficacy of macrocyclic lactones against *Psoroptes ovis* in cattle

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Abstract
Psoroptic mange is an important disease in beef cattle, and Belgian Blue cattle are particularly susceptible. Treatment failure of macrocyclic lactones (ML) against *Psoroptes ovis* has been reported, but clear evidence for resistance of *P. ovis* against ML in cattle is lacking. This study was conducted to investigate ML efficacy in 16 beef farms in Belgium and The Netherlands *in vivo* and *in vitro.*
On each farm a group of animals (n= 7-14) with clinical psoroptic mange was treated with two subcutaneous injections of a short-acting ML with 7-10 days interval (n=15) or a single injection with a long-acting ML (n=1). *In vivo* efficacy was assessed by the reduction in mite counts and the cure rate after the first treatment round and the number of treatment rounds needed to cure all animals. *In vitro* knock-down and mortality was evaluated in a contact assay based on Brimer et al., 1995 (Vet Parasitol 59, 249-255).
All farms needed ≥ 2 treatment rounds (2-8) to obtain full efficacy. Cure rates varied from 0%-80%. Only three farms had a mite count reduction of >90%, two of which had a lower limit of the confidence interval of <90%. All other farms had a mite count reduction <90% (-411%-81%). LD_{50} values *in vitro* varied from 2,951-36,867 μg/mL and 0.3-58.3 μg/mL at 24h and 120h, respectively. No significant correlation was found between *in vitro* LD_{50} values and any of the parameters for *in vivo* efficacy.
In conclusion, unambiguous treatment failure was detected on 13/16 beef farms, confirming the presence of ML resistance in Belgian Blue beef farms. Tentative *in vitro* parameters could not detect ML resistance. The potential use of different *in vitro* and *in vivo* parameters to evaluate acaricide efficacy and to detect acaricide resistance will be discussed.